CLAIMS

1. A disk device comprising:

a head for reading a plurality of servo information which have a series of servo information numbers and are recorded on a disk;

a phase learning means for learning a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number that is read by the head and a sinusoidal wave indicating variations in the amount of eccentricity of the disk;

a subtraction means for detecting a positional error of the head on the basis of a target position of the head that is supplied from the outside, and the current position of the head;

a sinusoidal wave generation means for generating an eccentricity sync sinusoidal wave having the phase error amount learned by the phase learning means, at a frequency synchronized with a rotation frequency of the disk;

an eccentricity control amount calculation means for calculating a weight factor on the basis of the eccentricity sync sinusoidal wave and the positional error of the head, and multiplying the eccentricity sync sinusoidal wave by the weight factor to obtain an eccentricity control amount;

a positioning control means for controlling positioning of the head on the basis of the positional error of the head and the

eccentricity control amount; and

an eccentricity control amount initial learning means for previously storing the phase error amount learned by the phase learning means, and a weight factor of each of plural areas into which the disk is concentrically divided;

wherein, during a settling operation, said eccentricity control amount calculation means reads a phase error amount and a weight factor corresponding to the target position of the head from the eccentricity control amount initial learning means, and calculates an eccentricity control amount using the phase error amount and the weight factor which have been read out.

2. A disk device as defined in Claim 1 wherein

said eccentricity control amount initial learning means previously stores an approximate expression that expresses the relationship between a weight factor of each of the plural areas into which the disk is concentrically divided, and the target position of the head, instead of the phase error amount learned by the phase learning means and the weight factor; and

during the settling operation, said eccentricity control amount calculation means reads the phase error amount and the approximate expression corresponding to the target position of the head from the eccentricity control amount initial learning means, and calculates a weight factor corresponding to the target position of the head from the read approximate expression, and

further, calculates an eccentricity control amount using the calculated weight factor and the read phase error amount.

3. A disk device as defined in Claim 1 further including:

a plurality of heads for reading a plurality of servo information which have a series of servo information numbers and are recorded on a plurality of disk surfaces, said heads being provided for the respective disk surfaces;

wherein said eccentricity control amount initial learning means previously stores the phase error amount learned by the phase learning means, and a weight factor of each of the plural areas into which the disk is concentrically divided on each of the disk surfaces read by the respective heads; and

during a head switching operation, said eccentricity control amount calculation means reads a phase error amount and a weight factor corresponding to the target position of the head after head switching, from the eccentricity control amount initial learning means, and calculates an eccentricity control amount using the phase error amount and the weight factor which have been read out.

4. A disk device as defined in Claim 1 further including:

a plurality of heads for reading a plurality of servo information which have a series of servo information numbers and are recorded on a plurality of disks, respectively;

wherein said eccentricity control amount initial learning means previously stores the phase error amount learned by the phase error means, and a weight factor of each of the plural areas into which each disk is concentrically divided; and

during a head switching operation to a head on a different disk, said eccentricity control amount calculation means reads a phase error amount and a weight factor corresponding to the target position of the head after the head switching, from the eccentricity control amount initial learning means, and calculates an eccentricity control amount using the phase error amount and the weight factor which have been read out.

5. A disk device comprising:

a head for reading a plurality of servo information which have a series of servo information numbers and are recorded on a disk;

a phase learning means for learning a phase error amount which is a phase difference between a sawtooth waveform indicating a change in the servo information number read by the head and a sinusoidal wave indicating a change in an amount of eccentricity of the disk;

a first subtraction means for calculating an positional error and a remaining distance of the head, on the basis of a target position of the head that is supplied from the outside, and the current position of the head;

a sinusoidal wave generation means for generating an eccentricity sync sinusoidal wave having the phase error amount learned by the phase learning means, at a frequency synchronized with the rotation frequency of the disk;

an eccentricity control amount calculation means for calculating a weight factor on the basis of the eccentricity sync sinusoidal wave and the positional error of the head, and multiplying the eccentricity sync sinusoidal wave by the weight factor to obtain an eccentricity control amount;

a positioning control means for controlling positioning of the head on the basis of the positional error of the head and the eccentricity control amount, during settling operation and tracking operation;

an eccentricity control amount initial learning means for previously storing the phase error amount learned by the phase learning means, and a weight factor of each of plural areas into which the disk is concentrically divided;

a reference speed calculation means for calculating a target speed according to the remaining distance of the head;

a head speed calculation means for calculating an actual moving speed of the head;

a second subtraction means for calculating a speed error of the head on the basis of the actual moving speed of the head and the target speed; and

a speed control means for controlling, during seek operation,

positioning of the head by using the speed error of the head that is calculated by the second subtraction means, and an eccentricity control amount that is calculated by the eccentricity control amount calculation means using a phase error amount and a weight factor corresponding to the current position of the head, which are stored in the eccentricity control amount initial learning means.

6. A disk device comprising:

a head for reading a plurality of servo information which have a series of servo information numbers and are recorded on a disk;

a phase learning means for learning a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by the head and a sinusoidal wave indicating variations in the amount of eccentricity of the disk;

a subtraction means for detecting a positional error of the head on the basis of a target position of the head that is supplied from the outside, and the current position of the head;

a sinusoidal wave generation means for generating an eccentricity sync sinusoidal wave having the phase error amount learned by the phase learning means, at a frequency synchronized with the rotation frequency of the disk;

an eccentricity control amount calculation means for

calculating a weight factor on the basis of the eccentricity sync sinusoidal wave and the positional error of the head, and multiplying the eccentricity sync sinusoidal wave by the weight factor to obtain an eccentricity control amount;

a positioning control means for controlling positioning of the head on the basis of the positional error of the head and the eccentricity control amount;

a positional error change amount calculation means for calculating an amount of change in the positional error of the head; and

an eccentricity learning switching judgement means for making the eccentricity control amount calculation means stop calculation of weight factor when the amount of change calculated by the positional error change amount calculation means exceeds a predetermined value.

7. A disk device comprising:

a head for reading a plurality of servo information which have a series of servo information numbers and are recorded on a disk;

a phase learning means for learning a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by the head and a sinusoidal wave indicating variations in the amount of eccentricity of the disk;

a subtraction means for detecting a positional error of the head on the basis of a target position of the head that is supplied from the outside, and the current position of the head;

a sinusoidal wave generation means for generating an eccentricity sync sinusoidal wave having the phase error amount learned by the phase learning means, at a frequency synchronized with the rotation frequency of the disk;

an eccentricity control amount calculation means for calculating a weight factor on the basis of the eccentricity sync sinusoidal wave and the positional error of the head, and multiplying the eccentricity sync sinusoidal wave by the weight factor to obtain an eccentricity control amount;

a positioning control means for controlling positioning of the head on the basis of the positional error of the head and the eccentricity control amount;

an impact detection means for outputting a voltage according to an impact that is applied to the disk device from the outside; and

an eccentricity learning switching judgement means for making the eccentricity control amount calculation means stop calculation of weight factor when the voltage outputted from the impact detection means exceeds a predetermined value.

8. A disk eccentricity control method comprising:

previously storing a phase error amount which is a phase

difference between a sawtooth waveform indicating variations in the servo information number read by the head and a sinusoidal wave indicating variations in the amount of eccentricity of the disk, and a weight factor of each of plural areas into which the disk is concentrically divided; and

during a settling operation, reading a phase error amount and a weight factor corresponding to a target position of the head from the phase error amounts and the weight factors which have previously been stored, and calculating an eccentricity control amount using the phase error amount and the weight factor which have been read out.

9. A disk eccentricity control method comprising:

previously storing a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by the head and a sinusoidal wave indicating variations in the amount of eccentricity of the disk, and an approximate expression which expresses the relationship between a weight factor of each of plural areas into which the disk is concentrically divided and a target position of the head; and

during a settling operation, reading a phase error amount and an approximate expression corresponding to the target position of the head from the phase error amounts and the approximate expressions which have previously been stored, and calculating a

weight factor corresponding to the target position of the head from the read approximate expression, and further, calculating an eccentricity control amount using the calculated weight factor and the read phase error amount.

10. A disk eccentricity control method comprising:

previously storing a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by the head and a sinusoidal wave indicating variations in the amount of eccentricity of the disk, and a weight factor of each of plural areas into which the disk is concentrically divided on each of disk surfaces read by plural heads, respectively; and

during a head switching operation, reading a phase error amount and a weight factor corresponding to the target position of the head after the head switching, from the phase error amounts and the weight factors which have previously been stored, and calculating an eccentricity control amount using the phase error amount and the weight factor which have been read out.

11. A disk eccentricity control method comprising:

previously storing a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by the head and a sinusoidal wave indicating variations in the amount of eccentricity of the

disk, and a phase error amount and a weight factor corresponding to each of plural areas into which each of plural disks is concentrically divided; and

during a head switching operation to a head on a different disk, reading a phase error amount and a weight factor corresponding to the target position of the head after the head switching, from the phase error amounts and the weight factors which have previously been stored, and calculating an eccentricity control amount using the phase error amount and the weight factor which have been read out.

12. A disk eccentricity control method comprising:

calculating a positional error and a remaining distance of a head on the basis of a target position of the head which is externally input, and a current position of the head;

calculating a target speed according to the remaining distance of the head;

calculating an actual moving speed of the head;

calculating a speed error of the head on the basis of the actual moving speed and the target speed of the head;

previously storing a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by the head and a sinusoidal wave indicating variations in the amount of eccentricity of the disk, and a weight factor corresponding to each of plural areas

into which the disk is concentrically divided; and

during a seek operation, calculating an eccentricity control amount using a phase error amount and a weight factor which correspond to the current position of the head and are previously stored, and controlling positioning of the head using the calculated eccentricity control amount and the calculated speed error of the head.

13. A disk eccentricity control method comprising:

calculating a positional error of a head on the basis of a target position of the head which is supplied from the outside, and a current position of the head;

calculating an amount of change in the positional error of the head; and

stopping calculation of weight factor when the calculated amount of change in the positional error of the head exceeds a predetermined value.

14. A disk eccentricity control method comprising:

detecting an impact applied from outside a device;

converting the detected impact into a voltage, and outputting the voltage; and

stopping calculation of weight factor when the outputted voltage exceeds a predetermined value.

15. A recording medium on which a program is recorded, said program comprising:

previously storing a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by a head and a sinusoidal wave indicating variations in the amount of eccentricity of a disk, and a weight factor of each of plural areas into which the disk is concentrically divided; and

during a settling operation, reading a phase error amount and a weight factor corresponding to a target position of the head from the phase error amounts and the weight factors which have previously been stored, and calculating an eccentricity control amount using the phase error amount and the weight factor which have been read out.

16. A recording medium on which a program is recorded, said program comprising:

previously storing a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by a head and a sinusoidal wave indicating variations in the amount of eccentricity of a disk, and an approximate expression which expresses the relationship between a weight factor of each of plural areas into which the disk is concentrically divided and a target position of the head; and

during a settling operation, reading a phase error amount and an approximate expression corresponding to the target position of the head from the phase error amounts and the approximate expressions which have previously been stored, and calculating a weight factor corresponding to the target position of the head from the read approximate expression, and further, calculating an eccentricity control amount using the calculated weight factor and the read phase error amount.

17. A recording medium on which a program is recorded, said program comprising:

previously storing a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by a head and a sinusoidal wave indicating variations in the amount of eccentricity of a disk, and a weight factor of each of plural areas into which the disk is concentrically divided on each of disk surfaces that are read by plural heads, respectively; and

during a head switching operation, reading a phase error amount and a weight factor corresponding to the target position of the head after the head switching, from the phase error amounts and the weight factors which have previously been stored, and calculating an eccentricity control amount using the phase error amount and the weight factor which have been read.

18. A disk eccentricity control method comprising:

previously storing a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by a head and a sinusoidal wave indicating variations in the amount of eccentricity of a disk, and a phase error amount and a weight factor corresponding to each of plural areas into which each of plural disks is concentrically divided; and

during a head switching operation to a head on a different disk, reading a phase error amount and a weight factor corresponding to the target position of the head after the head switching, from the phase error amounts and the weight factors which have previously been stored, and calculating an eccentricity control amount using the phase error amount and the weight factor which have been read out.

19. A recording medium in which a program is recorded, said program comprising:

calculating a positional error and a remaining distance of a head on the basis of a target position of the head which is externally input, and a current position of the head;

calculating a target speed according to the remaining distance of the head;

calculating an actual moving speed of the head;

calculating a speed error of the head on the basis of the

actual moving speed and the target speed of the head;

previously storing a phase error amount which is a phase difference between a sawtooth waveform indicating variations in the servo information number read by the head and a sinusoidal wave indicating variations in the amount of eccentricity of a disk, and a weight factor corresponding to each of plural areas into which the disk is concentrically divided; and

during a seek operation, calculating an eccentricity control amount using a phase error amount and a weight factor corresponding to the current position of the head, which have previously been stored, and controlling positioning of the head using the calculated eccentricity control amount and the calculated speed error of the head.

20. A recording medium in which a program is recorded, said program comprising:

calculating a positional error of a head on the basis of a target position of the head which is supplied from the outside, and a current position of the head;

calculating an amount of change in the positional error of the head; and

stopping calculation of weight factor when the calculated amount of change in the positional error of the head exceeds a predetermined value.

21. A recording medium in which a program is recorded, said program comprising:

detecting an impact applied from outside a device;

converting the detected impact into a voltage, and outputting the voltage; and

stopping calculation of weight factor when the outputted voltage exceeds a predetermined value.